Magnetic properties of the chain antiferromagnet $RbFeSe_2$

Seidov Z.[1,2], Krug von Nidda H.-A.[1], Tsurkan V.[1,3], Filipova I.[3], Günther A.[1], Aliyev M.[4], Vagizov F.[5], Kiiamov A.[5], Tagirov L.[5,6], Gavrilova T.[6] and Loidl A.[1]

[1]*Experimental Physics V, Center for Electronic Correlations and Magnetism, University of Augsburg, Augsburg (Germany)*
[2]*Institute of Physics, Azerbaijan Academy of Sciences, Baku (Azerbaijan)*
[3]*Institute of Applied Physics, Academy of Sciences of Moldova, Chisinau (Moldova)*
[4]*Baku State University, Chair of the Solid State Physics, Baku (Azerbaijan)*
[5]*Institute of Physics, Kazan Federal University, Kazan (Russia)*
[6]*E.K. Zavoisky Physical-Technical Institute, Russian Academy of Sciences, Kazan (Russia)*
zsyu@rambler.ru

Single crystals of the ternary iron selenide $RbFeSe_2$ (with linear chains of $FeSe_4$ tetrahedra) have been investigated by means of X-ray diffraction, Mössbauer, magnetic susceptibility and specific heat measurements. Our Mössbauer experiments performed from room temperature (RT) down to 4.2 K have shown that the compound undergoes a magnetic phase transition near 248 K. Mössbauer parameters determined in the entire temperature range indicate that iron in $RbFeSe_2$ is in ferric (trivalent) state having strong covalent bonding to selenium ligands. The measured hyperfine field of 216 kOe at 4.2 K is quite reduced compared with that in high-spin ferric compounds. The SQUID susceptibility and specific heat measurements confirm that $RbFeSe_2$ exhibits 3D collinear antiferromagnetic order below $T_N = 248$ K with magnetic moments oriented perpendicular to the chain direction. The strict linear increase of the susceptibility to high temperatures strongly suggests a one-dimensional metallic character of $RbFeSe_2$ along the chains.

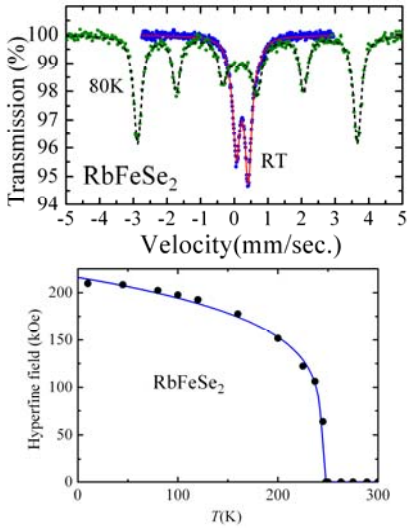

Fig. 1. Mössbauer spectra at RT and 80 K (top), hyperfine field *vs* temperature (bottom)

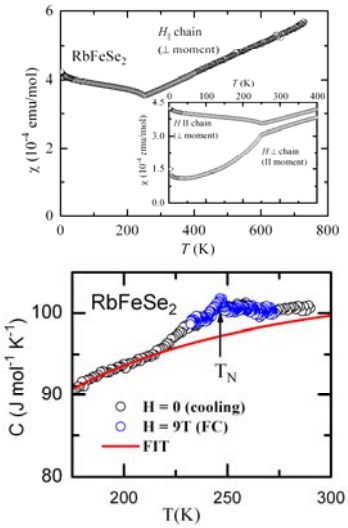

Fig. 2. Magnetic susceptibility *vs* temperature (top), specific heat *vs* temperature (bottom)